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ABSTRACT

Age-related and test-retest changes in reflection and impulsivity were investigated among preschool and school age subjects and senior adults. A study of each age group was conducted using either the Matching Familiar Figures test (MFF) or the Kansas Reflection-Impulsivity Scale for Preschoolers (KRISP). In all three studies the procedure was to administer the tests individually on four occasions separated by 10 to 20 days. Results are compared to normative MFF data which indicate a sequence of two strategic shifts with age: first, a shift from relatively fast, inaccurate (impulsive) responding to slow, accurate (reflective) response; and then a shift from slow-accurate (reflective) to fast-accurate (efficient) responding. Results of Study 1 resemble the normative data. In Study 2 only the efficiency shift occurred. The reflection shift is prominant in Study 3, while the efficiency shift, though present, is not by itself significant. Similar results were found in the test-retest comparisons. The occurrence of the same shifts at different ages indicates that the shifts in strategy occur not so much as a consequence of age-linked developmental changes in preferred strategies, but more as a consequence of the discovery of optimal strategies for a particular kind of task at a particular level of difficulty. The changes found in the normative data and in this study may be a necessary sequence of strategy development at any age. (Author/RH)

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Changes in Conceptual Tempo Over Time: Development vs. Logical Familiarization

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Changes in Conceptual Tempo Over Time:

Development vs. Logical Familiarization

This paper is concerned with changes over time in Reflection-Impulsivity as indexed by speed and accuracy of performance on the Matching Familiar Figures test (MFF), and a simpler form, the Kansas Reflection-Impulsivity Scale for Preschoolers (KRISP). We are concerned with two kinds of change over time. The first is normative and refers to the implicit age-related changes underlying cross-sectional age norms for reflection-impulsivity based on first administrations of the MFF and the KRISP. Age differences presumably reflect changes based on maturation and experience in what skills and assumptions children bring with them to the task, and what strategic choices they therefore adopt.

The second change over time is experiential. It refers to short-term changes within individuals as they undertake the MFF or the KRISP on four occasions 10 to 20 days apart. These changes presumably reflect familiarization with the task materials and logical requirements of the tests.

Normative data assembled by Salkind on first administrations of the MFF, based on 2,846 children are shown in Figure 1. These data indicate a sequence

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Figure 1 about here

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of two strategic shifts with age: First a shift from relatively fast, inaccurate (impulsive) responding to slow, accurate (reflective) response; and then a shift from slow-accurate (reflective) to fast-accurate (efficient) responding. The non-monotonicity of the latency data with increasing age (up

then down) indicate a strategic change as occurring at about ten years of age for the MFF, where the reflection shift ends and the efficiency shift begins.

That this change is not a simple outcome of general cognitive development, however, is indicated by the performance of 1,408 preschoolers, whose latencies on the simpler KRISP show the same hump-shaped curve with age, as indicated in Figure 2. Like the older children, the preschoolers show monotonically

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Figure 2 about here

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declining errors, thus yielding the same strategic change pattern: a reflection shift, followed by an efficiency shift, but for the KRISP, the peak of reflectivity occurs at about age five years.

Therefore it is suggested that the two-shift phenomenon requires an explanation based at least in part on task difficulty and the child's familiarity with logical task requirements, rather than one based on age-correlated developmental changes alone.

Accordingly, three short-term longitudinal studies were undertaken, designed in each instance to determine whether the same two-phase strategic change as appeared with age in norms for single administrations would also characterize performance of the same persons retested on four occasions, regardless of age. If the reflection shift, followed by the efficiency shift were obtained, we also wanted to know whether the change depended more on familiarization with specific item content, or on a growing general familiarity with the test format and logic.

Subjects in Study I were 54 preschoolers, tested on the KRISP. Subjects in Study II were 53 third and fourth graders given the MFF. The subjects in Study III were 48 senior adults, aged 65 to 75 years, given a non-repeating mixture of MFF items and new items of the same format and difficulty level. In all three studies the procedure was to administer the tests individually on four occasions, separated by 10 to 20 days. The preschool and school-age subjects received the same items on each testing, but both item order and spatial position of alternatives within the array for each item were rescrambled between successive administrations. In each session the senior adults received three of the original 12 MFF items mixed with nine approximately equivalent new items. For them, no items were ever repeated.

Figure 3 shows the results of Study I. With the exception of session

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Figure 3 about here

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four, where a small unexpected loss in efficiency occurred, the results resemble the normative data: first a reflection shift from session 1 to session 2, and then an efficiency shift from session 2 to session 3. The curvilinear trend is significant; the discrepancy of the fourth session is not.

In Figure 4 are shown the results of Study II, where the same MFF items

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Figure 4 about here

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were given four times to third and fourth graders. Here, surprisingly, only the efficiency shift occurred. That is, latencies did not show the initial

rise found elsewhere -- they simply declined.

Finally, Figure 5 gives the results of Study III, where different

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Figure 5 about here

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(non-repeating) sets of MFF-type items were given on four occasions to senior adults. The reflection shift is prominent in these data, while the efficiency shift, though present, is not, by itself, significant.

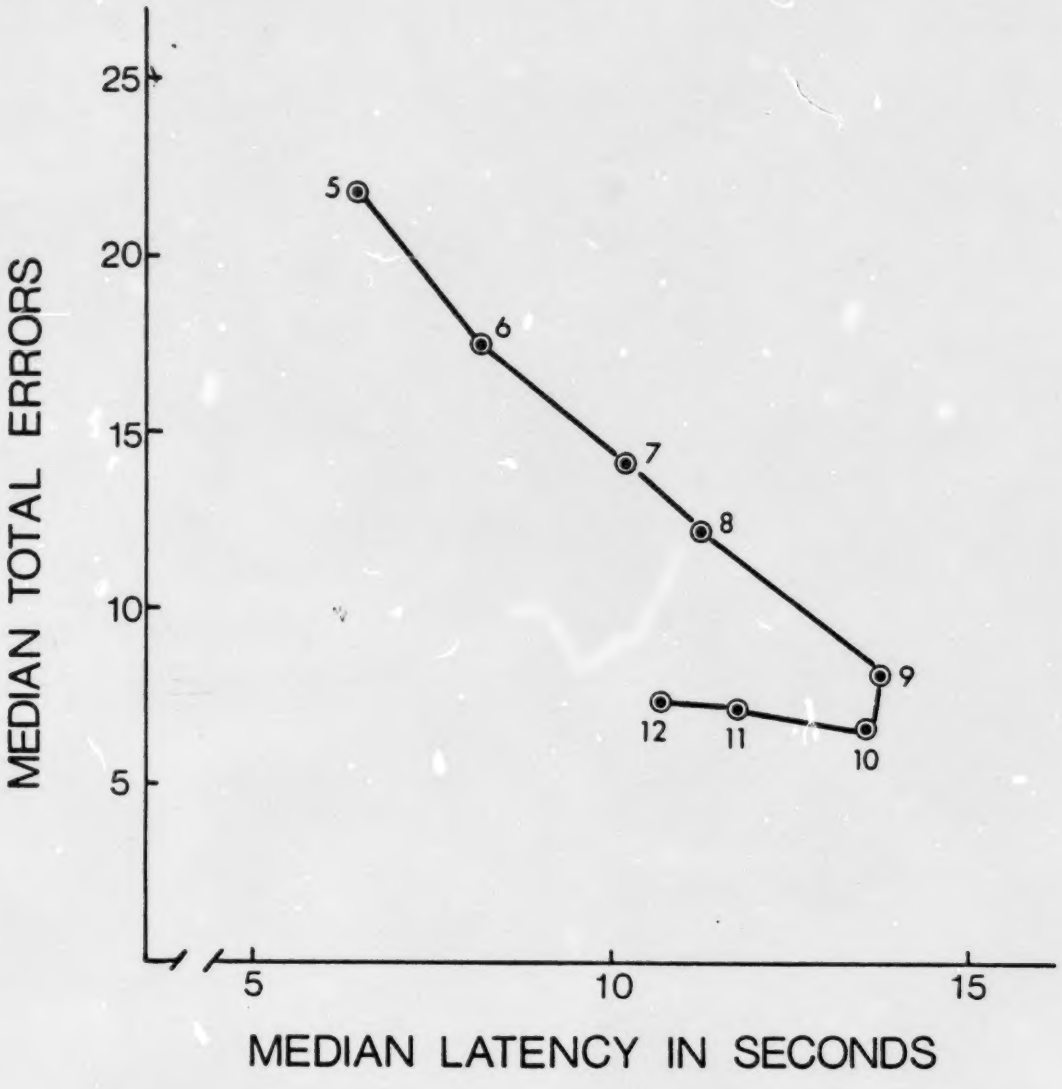
When testing is repeated with the same items, both the logical format of the task and the specific item content become familiar. For preschoolers not familiar with either, a slow-down in latency (reflection shift) was necessary in order to reduce errors. But with increasing familiarization, error rates declined, and after errors had reached a rate that was (to them) acceptably low, their latencies began to speed up again, but without a loss in accuracy (efficiency shift). The same was true of senior adults, but for them the reflection shift and subsequent efficiency shift must have been based on familiarization with the format and logical requirements of the task, because the item content never repeated. We contend that it is this logical familiarization that underlies the two-phase strategy change found in the norms.

The school-age subjects in Study II showed only the efficiency shift, without the preceding reflection shift. Following our own logic, we attribute this outcome to prior familiarization with the logical task requirements (recall that the normative reflection shift is almost complete by this age), and in some cases, where individuals had taken the MFF in earlier studies, to familiarization with specific item content. Because items were repeated over sessions,

evidence for the reflection shift may be obscured within the first session. It is our contention (and prediction for the next study) that if the school children had been given the non-repeating items used with the senior adults in Study III, the reflection shift would have been apparent in their data. Conversely, if the senior adults had been given the repeating set of MFF items, the efficiency shift would have predominated in their data.

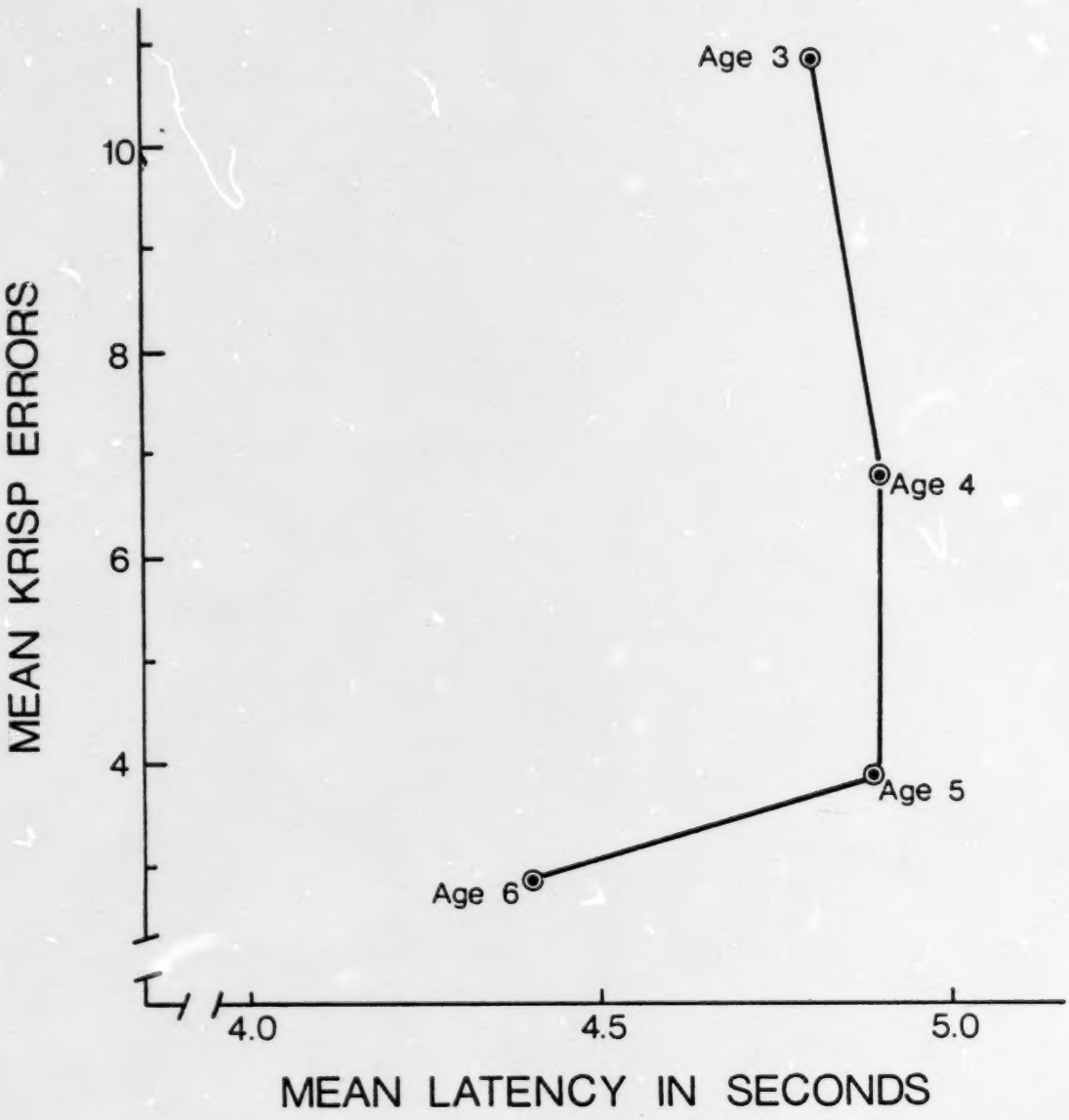
Five separate sets of data have been analyzed: two sets of cross-sectional age norms and three studies of repeated testing. In all of them the efficiency shift occurred, and in all but one it was preceded by the reflection shift. The occurrence of the same shifts at different ages supports our hypothesis that the shifts in strategy occur not so much as a consequence of age-linked developmental changes in preferred strategies, but more as a consequence of the discovery of optimal strategies for a particular kind of task at a particular level of difficulty.

We conclude that the necessary sequence of strategy development at any age consists of becoming increasingly cautious and analytic until one's error rate and risk are acceptably low -- the reflection shift -- and then accelerating response with increasing confidence as familiarity with task requirements is established -- the efficiency shift. We further conclude that the strategic change underlying the sequence of reflection, then efficiency shift is a consequence of increasing meta-cognitive appreciation of the speed-accuracy tradeoff inherent in tasks of high response uncertainty, and that these shifts in information processing strategy are not simple and direct consequences of general developmental change. The number and variety of tasks with which a child has become generalizably familiar increases with experience and explain the strategic shifts with age that are found even in the cross-sectional norms.



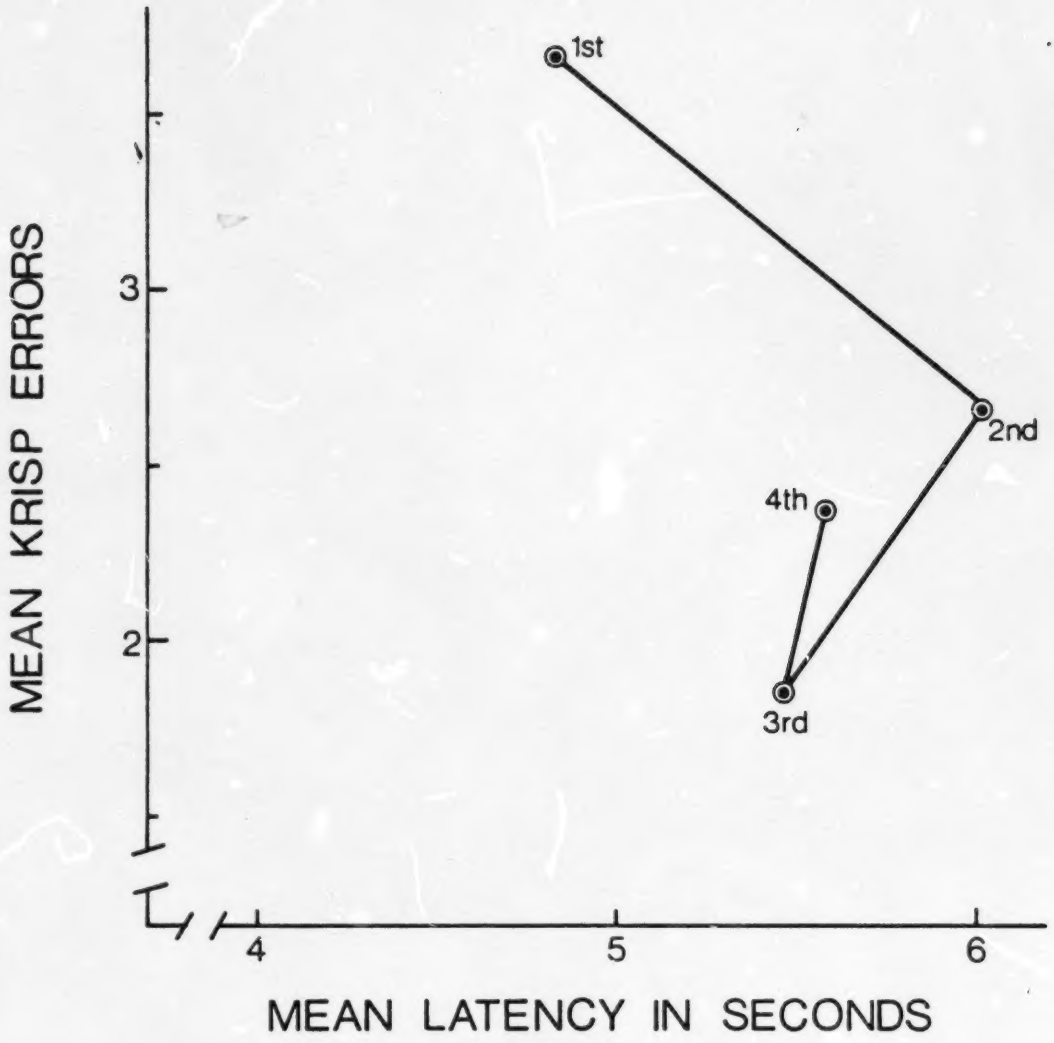
Median Latency and Errors at Eight Ages
For First MFF Administrations to
2,846 Children Aged 5 to 12 Years

Fig. 1



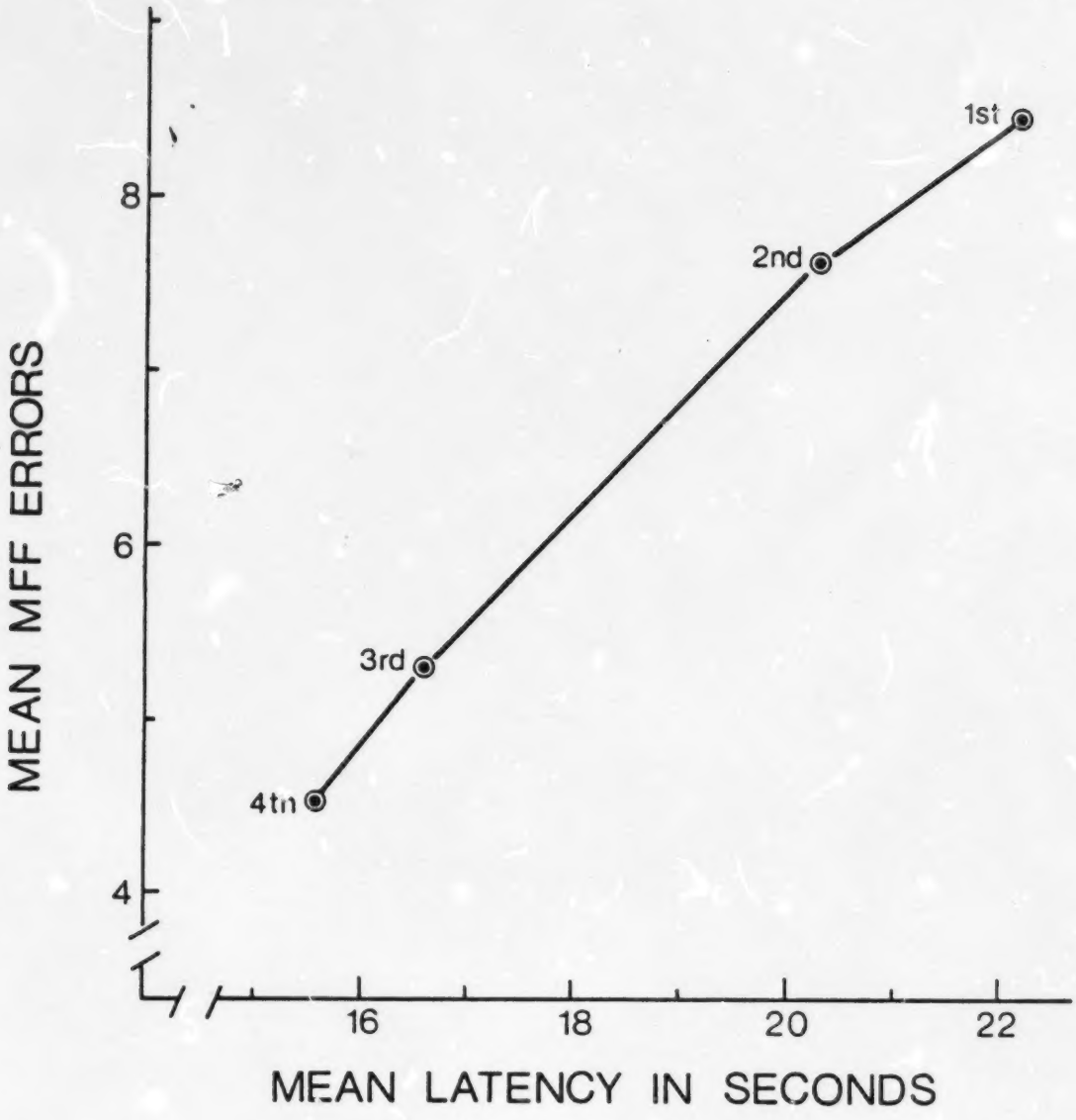
Mean Latency and Errors at Four Ages
For First KRISP Administrations to
1,408 Children Aged 2:5 to 6:8 Years

Fig. 2



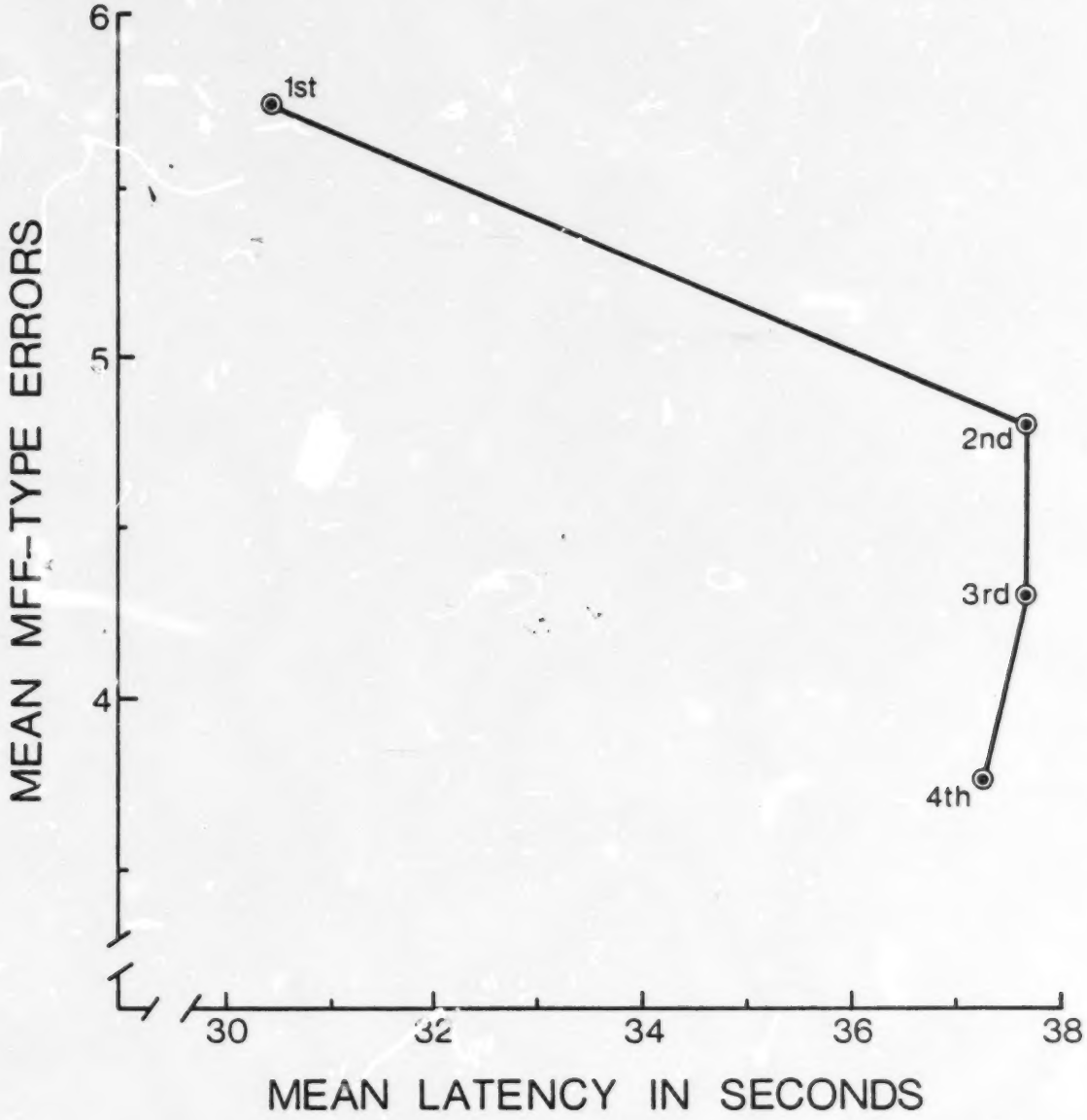
Mean Latency and Errors for Four Successive Administrations of the KRISP to 54 Preschool Children, 10 to 20 Days Apart

Fig. 3



Mean Latency and Errors for Four Successive Administrations of the MFF to 53 3rd and 4th Grade Children, 10 to 20 Days Apart

Fig. 4



Mean Latency and Errors for Four Successive Administrations of MFF-Type Items to 48 Senior Adults, 10 to 20 Days Apart

Fig. 5